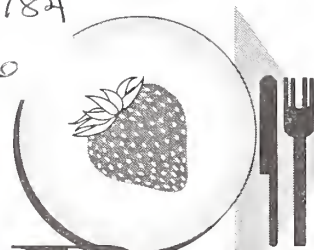


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Food & Nutrition Research Briefs

Growth Hormone Responsible for Weight Woes?

Hormonal differences that might help explain why African-American girls grow faster and taller than Caucasian girls could also be stacking the deck in favor of weight gain in adulthood. Researchers found higher blood levels of a potent growth hormone—free IGF-1—in African-American girls than in their Caucasian peers. The African-American girls had correspondingly lower blood levels of two specific binding proteins that tie up free IGF-1 in the bloodstream, making it inactive.

This raises the question of whether high levels of free IGF-1 are accelerating growth in African-American girls and whether these higher levels could be a factor in excessive weight gain if they persist once growth is complete, the researchers speculated in the *Journal of Pediatrics*, 1999 (vol. 135, pp. 296-300).

They designed the study to learn why African-American girls are more sexually mature, taller and heavier—with more muscle mass and body fat—than Caucasian girls. It involved 136 healthy African-American and Caucasian girls of normal weight between the ages of 9 and 17. It's the first study to report ethnic differences involving IGF-1, short for Insulin-like Growth Factor-1.

The findings suggest that insulin might be involved in how much free IGF-1 is in circulation in the body. Insulin inhibits production of one of the binding proteins that inactivate IGF-1. This connection is significant because healthy, normal-weight African-American children have higher blood insulin levels than Caucasians. High insulin is thought to predispose people to adult-onset (Type 2) diabetes. Even if diabetes doesn't develop, high insulin might contribute to high cholesterol, weight problems and hypertension—all more prevalent among African Americans.

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Video Game May Improve Kids' Eating Habits

A fun, fast-paced video game called "Squire's Quest!" might entice kids to eat more fruits and vegetables, according to the scientists who are creating and testing it with 1,600 children in Houston elementary schools. The video game is part of an innovative nutrition education program developed by research psychologists, behavioral nutritionists, a health educator and a freelance writer. U.S. children now eat only about two to three and one-half servings of fruit and vegetables daily, instead of the five to nine servings recommended for optimal physical and mental growth and development.

Each child playing the video game starts as a squire and enters into training to become a knight. Knights help to protect an imaginary kingdom called "Five-A-Lot" from invaders bent on destroying its fruits and vegetables. As squires earn points toward various levels of knighthood, they learn about fruits, 100-percent fruit juices, and veggies.

The game is part of a series of ten 25-minute classroom sessions in which kids make tasty virtual recipes using fruits and veggies. Then they set personal goals for making those recipes at home and for eating at least one more serving of a fruit or vegetable at a specific meal or snack. The scientists expect to finish analyzing the results of their education experiment by the end of summer 2000. An evaluation of their school-based intervention, Gimme 5, appears in *Health Education and Behavior*, 2000 (vol. 27(1), pp. 96-111).

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Natural Product Supplements Highly Variable

Chances are you'll get more antioxidant protection from eating fresh fruits and vegetables than from taking natural product supplements claiming to be potent antioxidants. That's according to analyses of 46 commercial preparations by the ORAC assay. ORAC—short for oxygen radical

absorbance capacity—measures the ability of a chemical or biological sample to disarm oxygen free radicals, which can precipitate a cascade of oxidative damage in body cells. Theory holds that such damage is behind heart disease, cancer and other diseases of aging. So antioxidant supplements are gaining popularity.

ARS researchers found the total antioxidant capacity of 40 berry-based supplements ranged from 16 to 3985 ORAC units—a 249-fold difference. The supplements tested included bilberry, cranberry, chokeberry and elderberry extracts. Six other antioxidant products having grape seed or pine bark extracts or pycnogenol ranged from 16 to 8392 ORAC units—a 525-fold difference. The results remind consumers that there are no industry standards for the antioxidant capacity of natural product supplements and thus little assurance of a high-quality product, the researchers reported in the *Journal of the American Nutraceutical Association*, 1999 (vol. 2, no. 2, pp. 46-56). An abstract of the article is on the Web at: <http://www.americanutra.com/jana-abstracts.html>.

A single serving of fresh or freshly cooked fruits or vegetables supplies an average of 300 to 400 ORAC units. Many fruits and vegetables—such as berries, plums, oranges, leafy greens and beets—provide much higher antioxidant levels. By contrast, 28 of the 40 berry extracts tested and one of the six other products wouldn't provide 300 ORAC units in a day's suggested intake.

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A New Family of Antibiotics — Maybe

While searching for natural compounds to control fungi in plants, ARS scientists may have stumbled onto new antibiotics against *Streptococcus* and *Staphylococcus* bacteria. They discovered a new family of antibiotic compounds—not related to penicillin—with potent antimicrobial activity. Although these compounds have not been tested against human pathogens, some of them may prove as good as or better than commercial antibiotics and should interest the pharmaceutical industry. The majority of *Staphylococcus* and *Streptococcus* species are resistant to penicillin and other antibiotics.

Six of the compounds isolated exhibit some degree of antibiotic activity against a broad spectrum of gram-negative and/or gram-positive genera of concern to both agriculture and medicine. The chemical makeup of the cell wall determines whether bacteria are classified as gram-positive or gram-negative. *Agrobacterium*, *Erwinia* and *Pseudomonas* are gram-negative genera, while *Bacillus*,

Micrococcus, *Staphylococcus* and *Streptococcus* are gram-positive.

Three of the compounds strongly suppressed *Staphylococcus* and *Streptococcus* species. One of the six compounds was very effective against all seven bacterial species tested. Just 10 micrograms per milliliter totally suppressed growth of or killed species of gram-positive bacteria in the *Micrococcus*, *Streptococcus*, *Staphylococcus* and *Bacillus* genera.

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Toward Boosting Calcium in Produce

Modifying a gene that causes plants to store excess calcium might one day make fruits, vegetables and grains a better source of this important nutrient. A researcher found that “turning on” a gene that controls the production of a protein called Calcium Exchanger 1 (CAX1) can increase the calcium content of plant cells. Maximizing the production of CAX1 increased the calcium content of root cells by more than 100 percent and that of leaf cells by nearly 30 percent, the researcher reported in *Plant Cell*, 1999 (vol.11, pp. 2113-2122).

He believes that CAX1 gene acts as a calcium regulator. When the calcium content of the cellular fluid gets too high, the gene is turned on. This triggers production of the CAX1 protein, which moves calcium out of the cellular fluid into a storage compartment. Once the calcium level returns to normal, the gene is turned off. By keeping the CAX1 gene turned on, the researcher created a condition where the calcium level of the cellular fluid was constantly depleted. While the mechanism is yet unknown, the end result was an increase in the cell's overall calcium content.

But the experiment had its downside. The CAX1 plants did not grow well in cold temperatures or in high levels of common soil minerals like magnesium and potassium. The next step is to limit CAX1 expression to the edible portions of plants. If successful, this might increase the calcium content of foods and enable the plant to maintain its ability to adapt to environmental stresses.

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Did You Get Enough K Today?

If you're between the ages of 18 and 44, chances are you didn't get enough vitamin K today . . . or any other day, according to a recent survey. Researchers with ARS and

Proctor & Gamble Company estimated vitamin K intake from a nationwide sample of 4,742 men, women and children.

Their findings, reported in the *Journal of the American Dietetic Association*, 1999 (vol. 99, pp.1072-1076): People over age 65 consumed more phyloquinone—the most common form of vitamin K—than 20- to 40-year olds. Only half the females age 13 and older—and less than half the males—got the Recommended Dietary Allowance, based on food intake diaries the survey volunteers kept for 14 days. The RDA is 65 micrograms per day for adult females and 80 mcg/day for adult males.

Long known for its role in blood clotting, vitamin K is gaining recognition for its importance to the integrity of bones. It activates at least three proteins involved in bone health. Phyloquinone is found in some oils, especially soybean oil, and in dark-green vegetables such as spinach and broccoli. One serving of spinach or two servings of broccoli provide four to five times the RDA.

In a study with Yale University School of Medicine, the researchers found that people absorb vitamin K just as well from broccoli as they do from oil. That's contrary to the notion that this fat-soluble vitamin is better absorbed from oil or oil-based supplements than from vegetables with their high water content. The study, reported in the *American Journal of Clinical Nutrition*, 1999 (vol. 70, pp. 368-377), also showed that 60- to 80-year-olds can increase their blood vitamin K levels just as readily as 20- to 40-year-olds by increasing their vitamin K intake.

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Getting Psyched Over the Internet

A person's nutritional status can affect behavior and learning. But only a handful of psychologists are involved in nutrition studies. So an ARS psychologist found a way to clone himself via the Internet. He computerized a battery of tasks for testing the cognitive and motor functions of study volunteers. He sends the tests to study leaders, receives the raw data, scores and analyzes the data in his lab, and returns the results—all electronically. So far, he has collaborated on nutrition studies in China, Guatemala, New Zealand, San Francisco, and Brownsville, Texas.

In the China study, he and researchers at the University of Texas Medical Branch in Galveston tested 1,400 school children via computers. It was the first long-distance study of its kind. And it was highly standardized, since the computer doesn't vary how it administers the tasks. Results showed that poor, urban Chinese children improved in

perception, memory and reasoning skills after getting extra zinc or zinc plus other essential vitamins and minerals.

Unlike the limited scope of most computerized tests, the ARS battery can assess the gamut of psychological functions. An overview of the battery appears in the *American Journal of Clinical Nutrition*, 1998 (vol. 68S, pp. 470S-475S). The battery can be tailored to fit any age, ethnic group or study protocol. Soon there will be a Windows version, capable of incorporating video, sound and external devices such as an electroencephalogram (EEG) for measuring volunteers' electrophysiological responses.

For more information, contact James Penland, 701-795-8471, Grand Forks Human Nutrition Research Center, Grand Forks, ND, jpenland@gfhnrc.ars.usda.gov.

An Accidental Tomato With High Lycopene

Tomatoes with much higher levels of lycopene may be available in the future if ARS research pans out. Lycopene, which gives tomatoes their bright red color, may help reduce the risk of some cancers, according to epidemiological research at the Harvard Medical School and Harvard School of Public Health.

While working with tomato tissue cultures, an ARS biologist got more than she expected. Not only did the culture develop into a tomato fruit, the fruit's green outer leaves, known as the calyx, also ripened into fruitlike tissue. In this particular tomato variety, called VFNT Cherry, low growing temperatures triggered ripening in nonfruit tissue. But the process doesn't work outside tissue culture. Something else in the plant prevents this transformation under normal growing conditions.

The fruit itself was very dark red with a lycopene content 10 times the amount in most commercial tomatoes, the researchers reported in the *Journal of Agricultural and Food Chemistry*, 1998, (vol 46, pp. 4577-4582). Now the researchers are looking for the genes that are activated to increase lycopene production so they can learn how to activate the genes in commercial varieties.

For more information, contact Betty Ishida, (510) 559-5726, Western Regional Research Center, Albany, CA, bkishida@pw.usda.gov.

Bean Counting for Calcium?

Some green beans outdo others as a source of bone-building calcium. The difference, according to researchers, can depend on how much water flows through the plants. The scientists compared calcium content in six bean varieties. The top performer, Hystyle, was also the stingiest water

user. Hystyle green beans have about double the calcium content of a variety called Labrador. That's because Hystyle is better at conserving water.

Water dilutes calcium moving through a bean plant, reducing the amount reaching the pods. Tiny pores called stomates open and close to control the speed at which water enters and leaves a plant. This transpiration, as it is called, is genetically and environmentally controlled. Overall transpiration in Hystyle was about half that of Labrador. The lower transpiration meant higher calcium concentrations in Hystyle's xylem stream. The xylem transports liquid and mineral nutrients from roots to shoots somewhat as a person's arteries carry oxygen-rich blood.

While dairy products are excellent calcium sources, beans and other veggies can also provide a substantial portion of the recommended intake. And these foods could play a bigger role for people who can't tolerate milk sugar.

For more information, contact Michael A. Grusak, (713) 798-7044, Children's Nutrition Research Center at Baylor College of Medicine, Houston, TX, mgrusak@bcm.tmc.edu.

Biofungicides — A New Generation

First introduced in the United States four years ago as a result of ARS patents, nontoxic biological coatings are replacing synthetic chemicals for controlling rot-causing fungi on apples, pears and citrus after harvest. ARS recently signed an agreement with Micro-Flo Company of Memphis, Tennessee, to finish developing the next generation of biofungicides for fruit packinghouses. Micro-Flo expects to have a product on the market within two years.

Researchers combined two bioactive substances with the yeast *Candida saitoana*. Innocuous to people, the yeast is a formidable competitor against fungi that attack fresh fruits. The bioactive substances are chitosan—a naturally occurring fiber found in some weight-loss products—and a synthetic sugar used as a glucose substitute. Chitosan acts as a natural fungicide and turns on defensive enzymes in the

fruit itself. It also forms a film on the fruit that holds in carbon dioxide, thus increasing shelf life. The synthetic sugar, on the other hand, tricks the fungi into perceiving it as food, but they can't use it.

Unlike the earlier biofungicides, the new coating controls fungi that already had a toehold on the fruit. In several years of tests in commercial packinghouses in California and Florida, the new biofungicide proved as effective against rot-causing fungi as the two leading synthetic fungicides. Under the new agreement, Micro-Flo and ARS scientists will optimize its formulation and fine-tune its application.

For more information, contact Charles L. Wilson, (304) 725-3451, ext. 330, Appalachian Fruit Research Station, Kearneysville, WV, Cwilson@afrs.ars.usda.gov.

Returning Groundwater, Waterways to Health

A USDA water quality program is changing the landscape of American agriculture. The program began in 1990 to reduce the amount of pesticides reaching groundwater. It was expanded three years ago to address broader environmental concerns, including harmful algal blooms. These blooms have created a widening "dead zone" in the Gulf of Mexico, where lack of oxygen kills shellfish. Pfiesteria and Red Tide algal blooms also have been implicated in fish-kills along the East Coast.

Reducing nitrogen loadings into the Mississippi River by 20 to 30 percent could increase oxygen levels in the Gulf by 15 to 50 percent, according to a recent National Science and Technology Council report. The USDA water quality program continues to show farmers how to reduce nitrogen loadings from commercial fertilizer and animal manure.

The program originally involved large Midwestern sites called Management Systems Evaluation Areas (MSEA). The 1996 merger with USDA's Agricultural Systems for Environmental Quality brought in concerns about phosphorus, air quality, soil management and off-site impacts. The merger also brought in Ohio's Lake Erie Basin, the Mississippi Delta region, and the eastern coastal plain.

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